

REMARKS

A. Background

Claims 1, 3, 5-9, 11, 12, and 15-23 were pending in the application at the time of the Office Action. All of the pending claims were rejected as being anticipated by and/or obvious over cited art. By this response applicant has cancelled claims 15, 16, and 23; amended claims 1, 7, and 17; and added new claims 24-28. As such, claims 1, 3, 5-9, 11, 12, and 17-22, and 24-28 are presented for the Examiner's consideration in light of the following remarks.

B. Proposed Claim Amendments

Applicant has herein amended independent claims 1, 7, and 17 and added new claims 24-28 to further clarify, more clearly define, and/or broaden the claimed inventions to expedite receiving a notice of allowance. For example, claims 1 and 17 have been amended to respectively incorporate the limitations of claims 15 and 23, which previously depended from claims 1 and 17 as well as to clarify that it is the overall cross section of the cap that varies in size along the path direction of the refrigerant flow. Claim 7 has been amended to recite that the cross section of the portion of the pipe through which the refrigerant flow moves upward varies in size along the path direction of the refrigerant flow. New dependent claims 24-28 recite further distinguishing limitations.

The amendments to the claims are supported in the application at least by Figures 4A and 4B and the corresponding discussion in the specification. In view of the foregoing, applicant submits that the amendments to the claims do not introduce new matter and entry thereof is respectfully requested.

C. Rejection based on 35 U.S.C. § 102

Paragraphs 1-2 of the Office Action reject claims 1, 5, 6, 15, 17, 18, and 22 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,898,051 to Schmid ("*Schmid*"). Inasmuch as claim 15 has been canceled herein, the rejection of that claim has been rendered moot and should be withdrawn. Regarding the rest of the rejected claims, Applicant respectfully traverses this rejection and submits that *Schmid* does not anticipate claims 1, 5, 6, 17, 18, and 22 because *Schmid* does not include each and every claim limitation recited in the rejected claims. Of the rejected claims, claim 1 and 17 are independent claims.

The refrigerant flow elements (a hollow cap 17 or a helical pipe 27) of the present invention are mounted directly outside the portion of the crucible where the seed crystal is placed so as to encircle the crucible. These elements are separated from a crucible support member so that the temperature controlling means can perform cooling or heating in the vicinity of the seed crystal (See Figures 6 and 9).

As shown in Figure 4A of the present application, cap 17 comprises two pathway portions, an inner pathway that abuts and encircles the portion of the crucible in which the seed crystal 14 is positioned, and an outer pathway positioned so as to encircle the inner pathway. As shown by the arrows in Figure 4A, the refrigerant flows upward through the first pathway and then downward through the second pathway.

Thus, as shown in Figure 4A, the overall cross section of the cap 17 at any one position includes both the inner and outer pathways. That is, the overall cross section of cap 17 extends from the outer edge of the outer pathway on one side of crucible to the outer edge of outer pathway 17 on the other side of the crucible, including the inner pathway disposed inside the outer pathway. As clearly shown in Figure 4A, this overall cross section of cap 17 gets narrower as one moves along the path direction of upward refrigerant flow. Conversely, it can be said that the overall cross section of cap 17 gets wider as one moves along the path direction of downward refrigerant flow. Either way, the overall cross section of cap 17 clearly varies in size along the path direction of refrigerant flow, as discussed in paragraph [0022] of the specification.

As shown in Figure 4B of the present application, pipe 27 comprises two portions, a first portion that abuts and helically encircles the portion of the crucible in which the seed crystal 14 is positioned, and a second portion that is positioned away from the crucible. As shown by the arrows in Figure 4B, the refrigerant flows upward through the first portion and downward through the second portion. As discussed in the specification and shown in Figure 4B, the cross section of the first portion of pipe 27 (i.e., the portion that abuts and helically encircles the portion of the crucible in which the seed crystal 14 is positioned) varies in size as one moves along the path direction of upward refrigerant flow.

In contrast, *Schmid* is directed to a crystal growing apparatus that includes an inlet tube 40 and an outlet tube 41 connected to a helium source 45. The helium refrigerant flows upward through the inlet tube 40 to cool the crystal and thereafter flows downward through outlet tube 41 to recirculate. Applicant notes that the combination of the inlet and outlet tubes 40, 41 has

been equated by the Examiner to the claimed “cap” (claim 1) and “refrigerant flow element” (claim 17) in the Office Action. As shown in Figure 1 of *Schmid*, the inlet tube 40 is completely disposed within the outlet tube 41. Furthermore, although outlet tube 41 has a larger diameter than inner tube 40, the respective diameters of each tube remain the same along the entire length of the respective tube. That is, the diameter of inlet tube 40 remains constant along the length of tube 40 and the diameter of outlet tube 41 remains constant along the length of tube 41. Thus, with inlet tube 40 disposed completely within outlet tube 41, the cross sectional size of the combined tubes is equal to the outer diameter of the outlet tube 41, which remains constant along its entire length.

Because the overall cross sectional size of the inlet tube 40/outlet tube 41 combination of *Schmid* remains constant along its entire length, and because the Office Action equates this combination to the claimed “cap” and “refrigerant flow element,” Applicant submits that *Schmid* does not disclose or suggest an apparatus for producing crystals having a cap or refrigerant flow element in which the “overall cross section of the cap” (claim 1) or “overall cross section of the refrigerant flow element” (claim 17) “varies in size along the path direction of the refrigerant flow,” as recited in amended independent claims 1 and 17.

Claims 5, 6, 15, 18, and 22 depend from claims 1 and 17 and thus incorporate the limitations thereof. As such, applicant submits that claims 5, 6, 15, 18, and 22 are distinguished over the cited art for at least the same reasons as discussed above with regard to claims 1 and 17. Accordingly, Applicant respectfully requests that the anticipation rejection with respect to claims 5, 6, 15, 18, and 22 also be withdrawn.

D. Rejection based on 35 U.S.C. § 103

Paragraphs 3-6 of the Office Action reject claims 3, 7-9, 11, 12, 16, 19-21, and 23 under 35 U.S.C. § 103(a) as being obvious over *Schmid*, and in some cases in view of further cited art. Claims 7-9, 11, 12, 16, 20, 21, and 23 were rejected in view of U.S. Patent Publications No. 5,567,399 to Von Ammon et al. (“*Von Ammon*”) and 2003/0084839 to Hemley et al. (“*Hemley*”); claims 7-9, 11, 12, 16, and 23 were rejected in view of U.S. Patent Publication No. 2004/0261691 to Doguchi (“*Doguchi*”). Inasmuch as claims 16 and 23 have been canceled herein, the rejection of those claims has been rendered moot and should be withdrawn. Regarding the rest of the rejected claims, Applicant respectfully traverses this rejection and

submits that a *prima facie* case of obviousness has not been established at least because the allegedly obvious combination would not include all of the limitations recited in the rejected claims. Of the rejected claims, claim 7 is an independent claim.

As noted above, the helium refrigerant in *Schmid* flows upward through the inlet tube 40 to cool the crystal and thereafter flows downward through outlet tube 41 to recirculate. Also as noted above, the diameter of inner tube 40 remains constant along the length of tube 40. As such, the cross sectional size of inlet tube 40, through which the refrigerant flows upward, does not vary along the length of the tube.

As such, Applicant submits that *Schmid* does not disclose or suggest an apparatus for producing crystals having a helical pipe in which “the cross section of the portion of the pipe through which the refrigerant flow moves upward varies in size along the path direction of the refrigerant flow,” as recited in amended independent claim 7.

Claims 3, 8, 9, 11, 12, and 19-21 depend from claims 1, 7, and 17 and thus incorporate the limitations thereof. As such, claims 3, 8, 9, 11, 12, and 19-21 each incorporate all of the limitations recited in one of claims 1, 7, and 17. That is, claims 3, 8, 9, 11, 12, and 19-21 each require a cap or refrigerant flow element in which the overall cross section of the cap or refrigerant flow element varies in size along the path direction of the refrigerant flow, or a pipe in which the cross section of the portion of the pipe through which the refrigerant flow moves upward varies in size along the path direction of the refrigerant flow.

However, none of the further cited references include the above limitations. As such, none of the further cited references cure the deficiencies of *Schmid*, discussed above. In light of this, even assuming, *arguendo*, that it would have been obvious to modify the *Schmid* apparatus based on the teachings of the further cited references in the manner set forth in the Office Action, the combinations would not include the above limitations. As such, a *prima facie* case of obviousness has not been established at least because the allegedly obvious combinations would not include all of the limitations recited in the rejected claims. Accordingly, Applicant respectfully requests that the obviousness rejection with respect to claims 3, 7-9, 11, 12, 16, 19-21, and 23 be withdrawn.

No other objections or rejections are set forth in the Office Action.

E. New Claims

New Claims 24-28 depend from claims 1, 7, and 17 and thus incorporate the limitations thereof. As such, applicant submits that claims 24-28 are distinguished over the cited art for at least the same reasons as discussed above with regard to claims 1, 7, and 17.

F. Conclusion

Applicant notes that this response does not discuss every reason why the claims of the present application are distinguished over the cited art. Most notably, applicant submits that many if not all of the dependent claims are independently distinguishable over the cited art. Applicant has merely submitted those arguments which it considers sufficient to clearly distinguish the claims over the cited art.

In view of the foregoing, applicant respectfully requests the Examiner's reconsideration and allowance of claims 1, 3, 5-9, 11, 12, and 17-22, and 24-28 as amended and presented herein.

The Commissioner is hereby authorized to charge payment of any of the following fees that may be applicable to this communication, or credit any overpayment, to Deposit Account No. 23-3178: (1) any filing fees required under 37 CFR § 1.16; (2) any patent application and reexamination processing fees under 37 CFR § 1.17; and/or (3) any post issuance fees under 37 CFR § 1.20. In addition, if any additional extension of time is required, which has not otherwise been requested, please consider this a petition therefor and charge any additional fees that may be required to Deposit Account No. 23-3178.

In the event there remains any impediment to allowance of the claims which could be clarified in a telephonic interview, the Examiner is respectfully requested to initiate such an interview with the undersigned.

Dated this 7th day of July 2010.

Respectfully submitted,

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